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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/986,987	11/13/2001	Takanobu Nishida	900-407	6028

23117 7590 07/15/2004

NIXON & VANDERHYE, PC
1100 N GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201-4714

EXAMINER

OLSEN, ALLAN W

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/986,987	NISHIDA, TAKANOBU	
	Examiner	Art Unit	
	Allan Olsen	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 23, 2004 has been entered.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-14 and 16- 20 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication 2003/0162407 of Maex et al. (hereinafter, Maex).

Maex teaches an etching method that includes the stripping or removal of a photoresist layer from an underlying insulating layer. The photoresist is removed by using a plasma generated from a mixture of O₂ and N₂. Maex teaches supplying RF energy from one power supply to excite the gas mixture into a plasma state while a separate power source supplies an RF bias potential to the substrate. Maex teaches using an RF plasma source power of 400 W and a RF bias power of 200 W while the substrate temperature is set at 20° C. Maex teaches that the method is designed to preserve the k-value of low-k dielectric materials. Maex teaches that the k-value is preserved by virtue of a protective coating that forms over. See: abstract; paragraphs [0018], [0063]-[0072] and [0085].

Claims 19 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,440,864 issued to Kropewnicki et al (hereinafter, Kropewnicki).

Kropewnicki teaches ashing a layer of photoresist with an oxygen plasma generated with between 100 and 5000 W of RF energy from a plasma source power supply while a second RF power supply provides between about 75 and 500 W of RF bias power to the pedestal electrode upon which the substrate is supported. As Kropewnicki teaches etching the same material with the same gases and under the same conditions as the claimed invention, the formation of a protective film it is considered to be an inherent feature of Kropewnicki.

Claim Rejections - 35 USC § 103

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Kropewnicki in view of U.S Patent 5,453,157 issued to Jeng.

Kropewnicki teaches ashing a layer of photoresist with an oxygen plasma generated with between 100 and 5000 W of RF energy from a plasma source power supply while a second RF power supply provides between about 75 and 500 W of RF bias power to the temperature controlled pedestal electrode upon which the substrate is supported. These power limits provide for a source/bias power ratio of as low as 0.2.

Kropewnicki teaches a temperature of about 15°C to about 20°C. See: col 2, ln 13-21; col 5, ln 22-25; col 6, ln 55-60; col 7, ln 27, 62-65; col 11 lns 22-25; and col 12 ln 50-52.

Kropewnicki does not explicitly teach that the low-k material is not damaged or that the value of the dielectric constant does not change by more than 10 %.

It would have been obvious to one skilled in the art to conduct the method of Kropewnicki in a manner that did not cause the dielectric constant of the low- k material to change by $\geq 10\%$ because Kropewnicki teaches the ashing of photoresist from atop a material having a dielectric constant of less than about 3.2 and more preferably less than about 3.0. As such, the dielectric constant of a material with the preferred dielectric constant of 3.0 cannot change by $\geq 10\%$ because this would result in a dielectric constant that exceeds Kropewnicki's upper limit of 3.2

As noted above, Kropewnicki teaches a temperature of about 15°C to about 20°C. While the examiner believes this temperature is recited in reference to the substrate temperature, Kropewnicki is not explicit on this point.

Jeng teaches a method of ashing photoresist etching that overlies a low-k dielectric layer. Jeng teaches that damage to polymeric low-k dielectric materials, such as those of Kropewnicki, can be eliminated by maintaining the temperature of the substrate between -20° C and 20°C during the photoresist ashing process.

It would have been obvious to one skilled in the art to maintain a substrate temperature of 20°C or less while carrying out the method of Kropewnicki because Kropewnicki is directed to a process of ashing photoresist in the presence of low-k dielectric materials and Jeng teaches that damage to the dielectric material can be

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eliminated by maintaining a low substrate temperature. Even if the skilled artisan does not presume that Kropewnicki's teaching of a 15°C-20°C temperature is directed to the substrate temperature, the skilled artisan would, nevertheless, be motivated to use the low substrate temperature of Jeng because Jeng teaches that this eliminates damage to the low-k material, which in turn eliminates the prospect of bringing about deleterious changes in the value of the dielectric constant.

Regarding claim 15, Kropewnicki does not teach the formation of a protective film on the surface of the insulating film. However, like Applicant, Kropewnicki teaches using a silicon-containing organic polymer as the low k insulating film. Applicant's specification (page 10) attributes the formation of protection film to the migration of silicon to the surface to react with the reactive oxygen species generated from the plasma. Kropewnicki does not discuss this aspect of the claimed invention, nevertheless, the claimed protective film must also be present in Kropewnicki.

Response to Arguments

Applicant's arguments filed September 29, 2003 have been fully considered but they are not persuasive.

Applicant's arguments with respect to Ohmi have been considered but are moot in view of the new ground of rejection. The rejection based on Ohmi has been withdrawn. However, it is noted that the examiner believes that Ohmi is applicable against the claimed invention. The rejection is withdrawn in favor of the rejection over Maex. Maex is favored merely because Maex contains explicit teachings regarding

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claimed limitations that Ohmi does not explicitly teach but which are considered inherent in Ohmi.

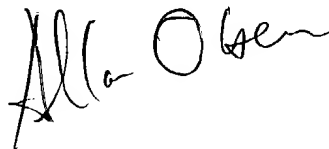
See also the remarks in the Advisory action of June 18, 2004.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M-F 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills can be reached on 571-272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Allan Olsen", with a stylized flourish at the end.

Allan Olsen
Primary Examiner
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